

2 March 1964

Declass Review by NGA.

MEMORANDUM FOR: Chairman, Technical Development Committee

THROUGH : Executive Secretary, TDC

SUBJECT : Staff Study - "Non-Reversible Color Recording Photographic System"

REFERENCE : [REDACTED] Proposal of 19 February 1964, entitled "Non-Reversible Color Recording".

1. PROBLEM:

To develop a completely dry, non-silver photographic duplication material capable of immediate print out of high resolution, continuous-tone, high contrast, permanent, transmission images by simultaneous exposure and heating in a one-step system.

2. FACTS:

a. For many years, silver-halide photography has provided the only practical medium on which high quality, continuous-tone reproductions could be made from original photographic acquisitions. The system has many well recognized qualities necessary for both acquisition and exploitation purposes. It possesses important attributes of high speed, high resolution, multi-spectral sensitivity and full tonal scale with variable contrast and density. As a system, silver-halide photography has proved to be our most valuable tool for the collection of intelligence data.

b. Advantages notwithstanding, the system has serious inherent limitations. Despite many improvements that have evolved during recent years, the concept has defied attempts to eliminate its principle disadvantages of: (1) wet processing; (2) non-adaptability to present day requirements for real-time printout; and (3) limitations in resolution due to grain size at practical emulsion sensitivity.

c. Several non-silver materials have been developed which are virtually grainless and capable of very high resolution. These are usually dye sensitized, react to a narrow spectral energy band and are dry or semi-dry processed. Although some of these systems hold certain future promise, each system lacks very essential characteristics that prohibit its full substitution for silver-halide mediums. The usual and most serious shortcoming is low sensitivity. Another is the lack of contrast control. Others are short tonal scale and low maximum density.

d. The requirement for and potential advantages of a high quality, continuous-tone, immediate printout photographic system should not be minimized. Fulfillment of this requirement would constitute a scientific breakthrough of

the highest magnitude. Failure of the silver-halide system and all non-silver efforts to achieve a dry and immediate printout system demand that each new and promising concept be investigated to establish its ultimate potential.

3. DISCUSSION:

a. The need for a completely dry, non-silver photographic duplication material capable of immediate printout of high resolution, continuous-tone, high contrast, permanent, transmission images in a one-step system requiring no operator skill is probably the most essential single requirement of the entire exploitation community. Such a breakthrough could provide each interpreter with his own immediate printout capability. It would eliminate the time delay required for duplication, inherent in the silver-halide system. A successful dry system would eliminate the need for large continuous film processors and result in vast monetary savings. Emulsions of molecular size particles would improve readout fidelity by eliminating image noise introduced by the silver grain structure.

b. In recent years, there have been many Government and privately sponsored development efforts directed towards producing a continuous-tone, dry, instantaneously processed photo-sensitive medium, free of known undesirable characteristics of silver-halide and at the same time, incorporating certain other desirable features not available in conventional silver-halide materials.

c. In every system known to the writer, all efforts have fallen short in fulfillment of total requirements that would justify substitution for silver-halide mediums for either acquisition or reproduction, where maximum image quality is a prime requisite.

X1 d. [redacted] recently described to the writer five (5) different unconventional photographic systems as listed below.

- (1) Photo Plastic Recording.
- (2) Photo Charge Process.
- (3) Reversible Color Process.
- (4) Irreversible Process.
- (5) Photo Metallic.

e. Selection of the above five (5) systems by [redacted] was based on the following parameters which they [redacted] believe will ultimately produce one or more unique and useful systems.

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- (1) Very high resolution (molecular resolution).
- (2) Continuous tone.
- (3) Instant and dry development.

- (4) Picture in radiation field.
- (5) X-ray and infrared sensitive.
- (6) No dark storage or handling.
- (7) Erased and reused.
- (8) Instant color pictures and hard copy.
- (9) Pictures or displays.
- (10) Microminiature circuits.

X1 f. The [ ] philosophy has been to exert effort only on concepts that show potential for satisfying ideal requirements at the exclusion of all other systems. This is believed to be a sound approach because absolute perfection of any system with fundamentally objectionable features would serve only a limited purpose.

g. Each of the five (5) [ ] systems has attractive characteristics for specific purposes. However, the irreversible process appears to possess characteristics that most uniquely coincide with requirements of any chip concept. It is a thermoplastic, dielectric, phototropic, polymer system containing components in molecular form capable of forming a colored dye image by electro-chemical reaction, when exposed to light and rapid heat. Formation of the image can be almost instantaneous when simultaneously exposed to light and heat. 25X

h. This material is formed in two layers only, a base and a single light sensitive layer. It is white light sensitive, can be coated to produce any desired color, including black, produces a molecular image (no grain), is completely dry, is heat processed and fixed. An image of a resolution bar target produced under the poorest condition, in the presence of the writer, resolved 260 l/mm under magnification.

X1 i. By reference, the [ ] proposes to conduct a study of the "Non-Reversible" system over a one year period at a total estimated cost of [ ]. This proposed study is designed to permit assessment of the feasibility of deriving a practical, non-reversible black and white recording process, together with associated materials, which permits high resolution, continuous-tone, high contrast images to be recorded instantaneously with development and fixation in one step, merely by heating. One of the results of this program will be a precise assessment of the further work required to obtain a practical medium which can be produced on demand. 25X

#### 4. CONCLUSIONS:

a. The ever increasing demands of modern collection and exploitation systems for quality, resolution and speed of image readout, make it imperative that a strong development effort be undertaken to overcome the limitations imposed by the silver-halide system.

X1 b. The conceptual originality and technical competence of the [ ] 25X  
[ ] is unique and exhibits unusual potential in the field  
of unconventional photographic systems.

c. The non-reversible concept proposed by [ ] appears 25X  
basically sound and justifies investigational support.

5. RECOMMENDATIONS:

X1 The [ ] proposal be accepted and that a contract be 25X  
negotiated at a total cost of [ ]

[ ] 25X  
Development Branch, P&DS

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(When Filled In)

# TECHNICAL BACKGROUND PROCUREMENT INFORMATION

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Contractor

A. Name and address:

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B. Evaluation of previous performance: None previous but company is known to be reliable and competent.

II. Brief description of this procurement: Study of the non-reversible color recording photographic system.

Estimated total amt.

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A. Deliverable items: Three quarterly reports and one detailed final report.

B. Is this procurement for other than a standard, "off the shelf" or slightly modified commercial item? Yes If "yes", is it anticipated that any more of this unit will be procured? Yes If so, a complete set of directly reproducible manufacturing drawings and specifications would normally be included in this procurement. Comments:

Drawings are not applicable. It is anticipated that the program will be extended next FY.

C. Will contract cover a period of more than 90 days? Yes  
If "yes", are progress reports desired? Yes If so, indicate frequency, content and number of copies desired:

Three quarterly reports and one final report.

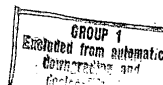
D. Is any Government-owned property to be provided to the contractor?

No.

If so, list and indicate its availability (where, when,

etc.) N. A.

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E. Is any special tooling involved? No.

F. Security:

1. Association with the Sponsor is [redacted]

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2. The specifications and/or drawings are NA

3. The item is NA

4. Contractor personnel known to be aware of this proposed procurement:

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[redacted]

5. Other security information None

III. Reasons for selection of this source. If other sources were considered, indicate results. If no other sources were considered, list the reasons why this firm is considered to be uniquely qualified to perform this work.

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The conceptual originality and technical competence of the [redacted] group is unique and exhibits unusual potential in the field of unconventional photographic systems.

IV. Technical contact

[redacted]

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Name

Telephone

In the event additional space is required, use the reverse side(s) of this form, with a reference to the item number to which the comment applies.

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